ATTACHMENT H

TECHNICAL MEMORANDUM 3 – BERM CONSTRUCTION DESIGN MODIFICATIONS

TO:	Linda Baker – Integral Consulting
FROM:	Mike Byers, P.E. – CRETE Consulting Inc.
	Kate Forester, Jason King – Herrera
PROJECT:	EVRAZ Oregon Steel Rivergate Facility
SUBJECT:	Technical Memorandum 3 – Berm Construction Design Modifications
DATE:	May 25, 2016
CC:	File

EVRAZ Oregon Steel (EOS) has completed a source control measure (SCM) which removed and stabilized contaminants in the riverbank at its Rivergate property in Portland, Oregon. This memorandum describes the modification and clarifications to the geotextile stabilization design and planting plan within the newly constructed berm, implemented during construction of the SCM. This memorandum provides additional stability analysis and provides an update to the stability calculations and discussion included in Attachment E "Technical Memorandum—Stability Analysis Riverbank Source Control Measure" of the Final Design Report Riverbank Source Control Measure [1] (11/2014 Study).

1.0 Background

The original design of the constructed berm included a granular imported berm backfill and the use of a reinforcement geotextile fabric placed every 2.5 feet within the berm backfill (identified as "lifts" in this memorandum) along the face of the berm. The tensile strength of the geotextile was required to be at least 100 pounds per inch (ASTM D-4595). Twelve inches of planting soil was to be placed over the exposed surface of the berm backfill to provide a growing media for plants and a heavy jute matting was to be placed on the surface of the planting soil.

A change was proposed to the berm backfill to provide a thicker layer of planting soil to enhance the overall moisture retention of the berm backfill. The change consisted of increasing the thickness of the planting soil to two feet (as measured perpendicular to the slope surface), decreasing the quantity of aggregate berm backfill to accommodate the thicker planting soil layer, and incorporating the thicker planting soil layer into the geotextile reinforcement layers to maintain the overall stability of the berm.

[1] Final Design Report Riverbank Source Control Measure – Evraz Oregon Steel. Prepared by CRETE Consulting and Integral Consulting. June 18, 2015.

The modifications are shown on Figure 1. No changes were made to the reinforcement geotextile type, the lift thickness, compaction within the lifts, the berm backfill material, or the planting (including the planting soil) specifications.

Slope Stability Verification

The riverbank stabilization with the revised berm backfill was evaluated to determine if the revision would result in any changes to the overall stability as a result of the change. The analyses methods, parameters, materials and results of the original study are detailed in the 11/2014 study. The new berm backfill scenario was compared with the 11/2014 study by inputting the revised berm conditions into one of the 11/2014 study scenarios and comparing the resulting factor of safety with the 11/2014 study factor of safety for the same water table/seismic conditions. The scenario that included ground water and river water at elevation 9.6 and seismic conditions was selected for comparison. Under these conditions (refer to run #4 in the 11/2014 study) the original factor of safety was 1.1. The revised berm factor of safety (See Attachment 1, Figure 1) was determined to be 1.1. The critical failure surface extends through unexcavated portions of the berm (same general location as in the 11/2014 study results) and not through the newly placed (and modified) berm backfill, so the fact that the factor of safety remains the same is expected. Given the location of the critical failure surface in relation to the modified berm backfill, and essentially no change in the calculated factor of safety, it is concluded that the revision to the berm backfill does not affect the overall slope stability as determined in the 11/2014 study. Conclusions contained in the 11/2014 study remain unchanged by the berm backfill modification.

2.0 Planting Plan Design Modifications

Native revegetation establishment is an important element in long-term slope stabilization. Planting native riparian forest vegetation with enough soil volume to support well-developed root systems aids in soil retention, health, and prevention of erosion. Native revegetation of the riparian forest along the Willamette River is subject to Title 33, Greenway Overlay Zones, and Title 11, Trees, mitigation requirements. Adding a thicker soil layer within the berm profile will enable plant installation of deep-rooted container stock and root establishment deeper into the bank profile. A deeper soil layer will promote long-term riparian forest health and survival.

The revised stabilized lift design provides suitable planting conditions to promote healthy plant establishment and is consistent with the performance requirements and design intent of establishing riparian forest along the Willamette River Greenway.

3.0 Summary

The geotextile stabilization design and planting plan modifications and clarifications implemented during construction of the SCM are consistent with the project design requirements and intent. The increased thickness of the planting soil layer enhances the overall moisture retention capacity of the berm and will better support plant establishment, consistent

with the mitigation requirements. It also provides the structural integrity necessary for containment associated with the SCM.

Figures

Figure 1 - Detail 1 from Drawing D-85801 Rev 0 and Rev 1

Attachments

Attachment 1 - Berm Stabilization Calculation (updated August 2015)

Figures

Figure 1 - Detail 1 from Drawing D-85801 Rev 0 and Rev 1

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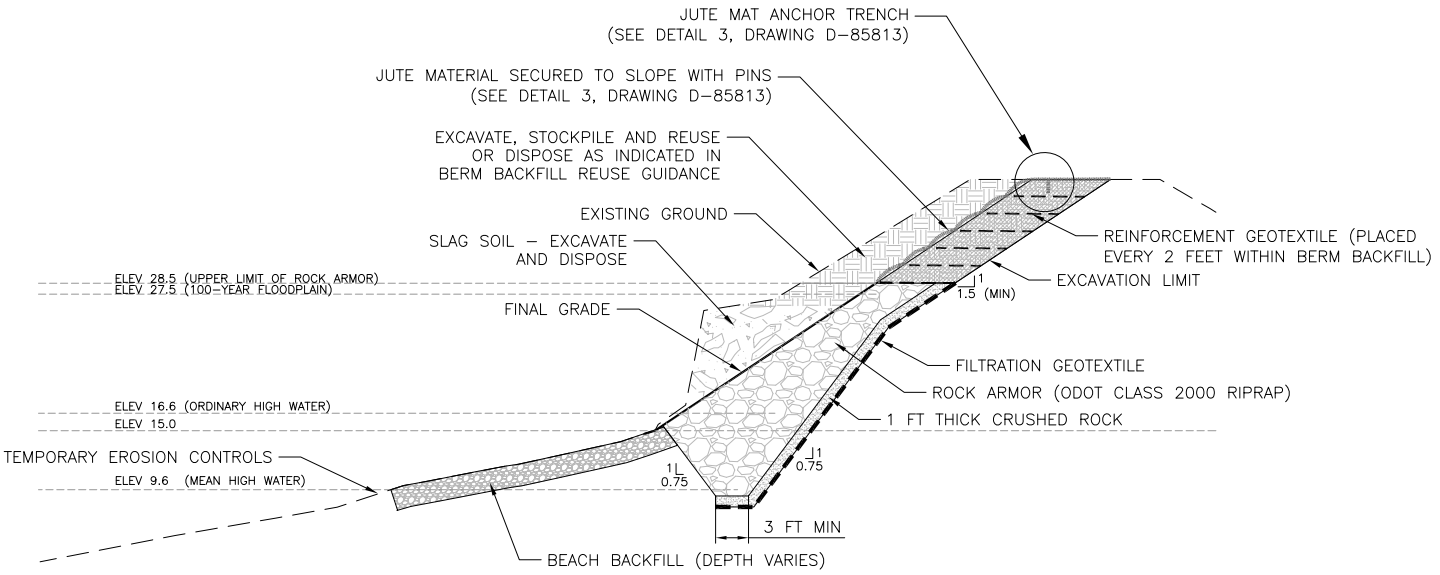
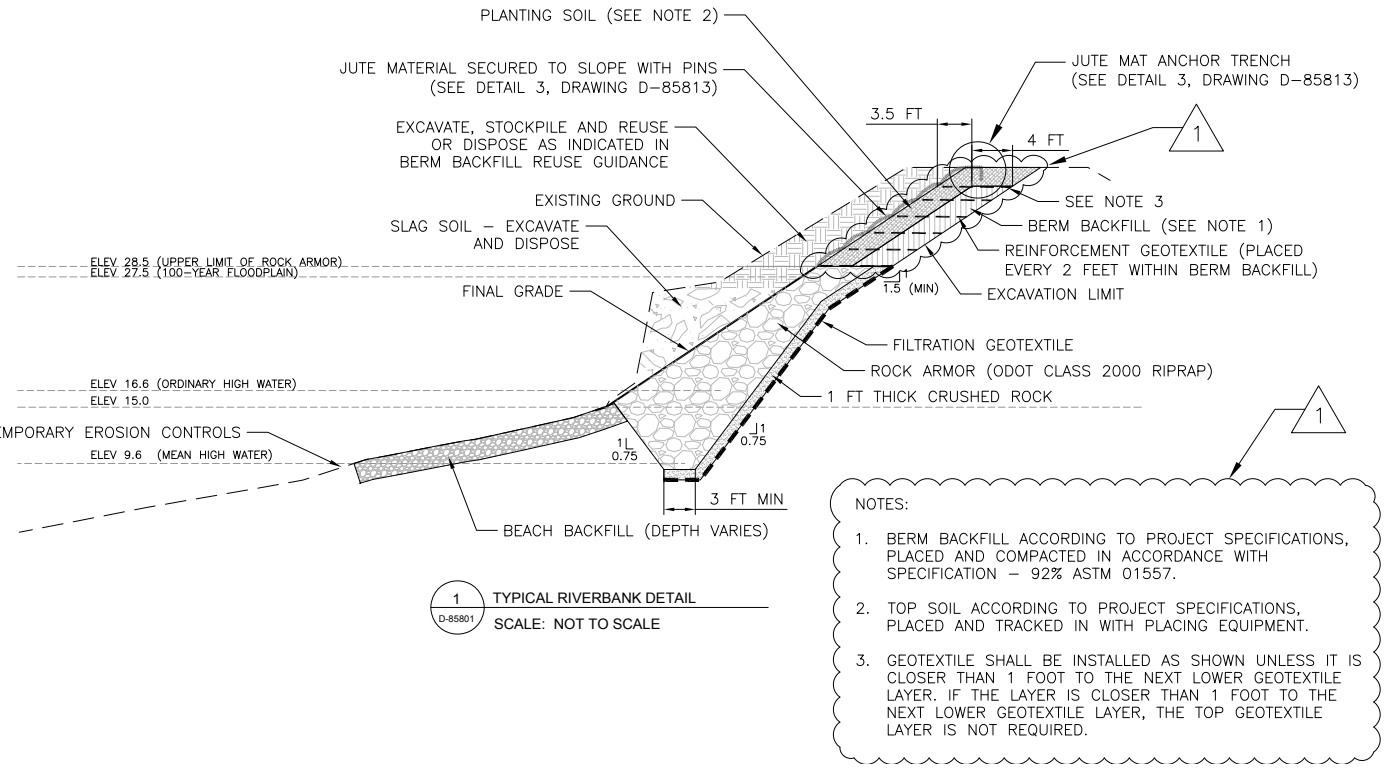


1 / D-85801 TYPICAL RIVERBANK DETAIL
SCALE: NOT TO SCALE

Original May 27, 2015



1 / D-85801 TYPICAL RIVERBANK DETAIL
SCALE: NOT TO SCALE

1

NOTES:

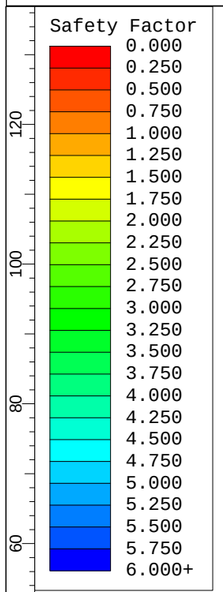
1. BERM BACKFILL ACCORDING TO PROJECT SPECIFICATIONS, PLACED AND COMPACTED IN ACCORDANCE WITH SPECIFICATION – 92% ASTM 01557.
2. TOP SOIL ACCORDING TO PROJECT SPECIFICATIONS, PLACED AND TRACKED IN WITH PLACING EQUIPMENT.
3. GEOTEXTILE SHALL BE INSTALLED AS SHOWN UNLESS IT IS CLOSER THAN 1 FOOT TO THE NEXT LOWER GEOTEXTILE LAYER. IF THE LAYER IS CLOSER THAN 1 FOOT TO THE NEXT LOWER GEOTEXTILE LAYER, THE TOP GEOTEXTILE LAYER IS NOT REQUIRED.

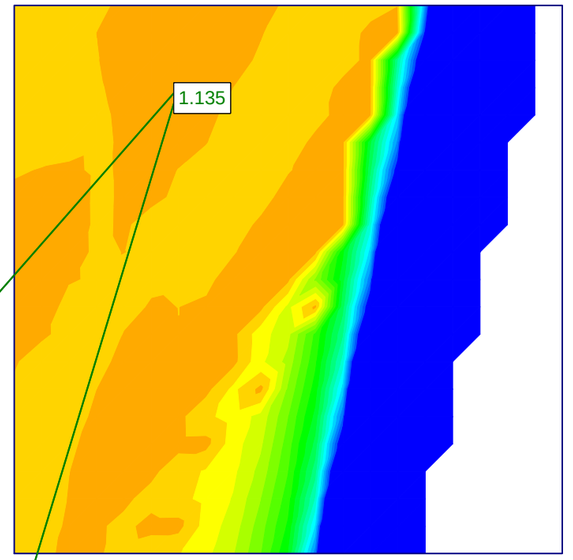
Revised September 23, 2015
Clouds track revisions

Attachments

Attachment 1 - Berm Stabilization Calculation (updated August 2015)

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Berm		114	Mohr-Coulomb	15	32	Water Surface	Custom	1	
Rock Armor		135	Mohr-Coulomb	0	44	Water Surface	Custom	1	
soil slag fill		121	Mohr-Coulomb	140	36	Water Surface	Custom	1	
Dredge fill		112	Mohr-Coulomb	0	32	Water Surface	Custom	1	
native		112	Mohr-Coulomb	0	32	Water Surface	Custom	1	
geotextile		120	Mohr-Coulomb	0	35	Water Surface	Custom	1	
water		120	No strength			None			0
crushed rock		130	Mohr-Coulomb	0	42	Water Surface	Custom	1	
Compacted berm backfill		120	Mohr-Coulomb	0	30	Water Surface	Custom	1	
planting soil		70	Mohr-Coulomb	0.02	26	Water Surface	Custom	1	
beach backfill		120	Mohr-Coulomb	0	35	Water Surface	Custom	1	





SLIDEINTERPRET 6.036

Project	Evraz Riverbank Stabilization Project		
Analysis Description			
Drawn By	MB	Scale	1:260
Company	CRETE Consulting Inc		
Date	8/31/2015	File Name	RB mid project lower revised berm.slim

Synteen Technical Fabrics, Inc.

SYNTEEN SF11 BIAXIAL GEOGRID

BASE COURSE REINFORCEMENT AND SUBGRADE IMPROVEMENT

SF11 is composed of high molecular weight, high tenacity multifilament polyester yarns, woven into a stable network placed under tension. The high strength polyester yarns are PVC coated and are inert to biological degradation and are resistant to naturally encountered chemicals, alkalis and acids.

REINFORCEMENT PROPERTIES		TEST METHOD	MARV VALUES	
			LB/FT	kN/m
Ultimate Strength	MD XMD	ASTM 6637	2,388 3,870	34.9 56.5
Initial Modulus	MD XMD	ASTM 6637	178,000 172,900	2,598 2,522
Load (Tensile Strength) at 2% Strain	MD XMD	ASTM 6637	526 578	7.7 8.4
2% Secant Moduli	MD XMD	ASTM 6637	26,300 28,900	383.6 421.5
Load (Tensile Strength) at 5% Strain	MD XMD	ASTM 6637	792 1,042	11.5 15.2
5% Secant Moduli	MD XMD	ASTM 6637	15,840 20,840	231 304
Aperture Stability – kg-cm/deg at 5.0 kg-cm		US COE	2.4	
Minimum Radial Stiffness at 0.5% Strain		ASTM 6637	172,900	2,522
Maximum Radial Stiffness at 0.5% Strain		ASTM 6637	178,000	2,598
Average Radial Stiffness at 0.5 % Strain Anticipated stiffness 45 degrees off the orthogonal axes tested. Representative of load spreading in all directions.		ASTM 6637	175,450	2,559
Junction Strength (lb./junction)	MD XMD	GRI-GG2	59.4 47.6	0.87 0.69
FHWA Sum of Junctions – Strength (81 total junctions)	MD XMD	GRI-GG2	4,811 3,856	70.2 56.2
FHWA Sum of Junctions – Efficiency	MD XMD	GRI-GG2	201% 100%	
Coefficient of Pullout Interaction		ASTM 6706 Sandy Gravel Sand	$C_i = 1.0$ $C_i = 1.0$	
Aperture Size	MD XMD	Measured	1.0 1.0	25 25
Roll Dimensions 12’ x 150’ 15’ x 150’ 17’ x 150’		Measured	 200 square yards per roll 250 square yards per roll 283 square yards per roll	

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Synteen Technical Fabrics, Inc.
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